

Patent Application
NC 84,352

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re : Villalobos et al
Serial No.: 10/601,884
Filed: June 24, 2003
Title: Spinel and Process for
Making Same

Examiner: Xu, Ling X.
Group Art Unit: 1775

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April 20, 2005

Declaration

Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

I, Jasbinder S. Sanghera, co-inventor in the above-identified patent application, following the interview with the Examiner Ling Xu on April 1, 2005, who suggested that a declaration be submitted, declare the following, all of which was discussed at the interview:

That to one of ordinary skill in the art, the terms "particle" and "grain," which is used in the Sellers reference (USP 3,768,990), refer to two distinct and non-interchangeable entities;

That a particle is a basic, easily divisible part of a powder while a grain is a subunit of a densified body, possessing in its entirety a crystal structure with a locally unique direction.

That the Sellers reference, where the inventors are of more

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than ordinary skill in the art, would not confuse the two designations;

That the Sellers reference mentions sub micron particle size in the Abstract; col. 1, lines 34-35; col. 1, line 61; col.1, lines 67-68; col. 2, line 15; col. 2, line 62; and col. 4, line 50.

That in all cases, the Sellers reference is referring to the sub-micron size of the starting powder particle size;

That careful reading of the supporting material in the Sellers reference confirms that the designations pertaining to the terms "particle" and "grain" were not mixed up;

That, it should be noted, that to one of ordinary skill in the art, the starting particle size of the powder has very little to do with the final grain size of the densified product;

That the final grain size in the spinel product is a function of the temperature, time at temperature, intermediate holds, pressure application schedule, reactivity of the starting powder, compositional variations in the starting powder, amount and type of additives and impurities, surrounding atmosphere, out gassing dynamics and a host of other effects that are not easily categorized.

That it is common, to the point of being an indisputable rule, that two identical powders of identical initial size and distribution, will not have the same final grain size unless

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identical procedures are followed.

That the above discussion is for a powder that does not need a sintering aid.

That if a sintering aid is needed for densification, one of ordinary skill in the art knows that identical grain size, distribution or even degree of densification, is unlikely even following identical procedure due to inhomogeneous mixing of the sintering aid with a powder on a microscopic scale, even though everyone calls it uniformly mixed;

That this is the reason that the success rate in the traditional method of densification for a spinel product is less than 50% and why even after 40 years, it is not yet a commercially available product;

That, in fact, the procedure disclosed in the Sellers reference leads to considerable exaggerated grain growth and large sized grains, not sub-micron, as the Examiner has concluded.

That the Sellers reference discloses in the Abstract; in col. 1, line 35; in col. 3, line 1; and in col. 4, line 26; that the lithium fluoride sintering aid is "uniformly mixed;"

That one knowledgeable in the art knows that it is not possible to mix a particulate sintering aid with a powder so that all powder particles are in contact with the sintering aid;

That it is geometrically impossible to uniformly mix a

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powdered sintering aid with a powder because sintering aids are typically added in quantities below 5% by weight;

That to further complicate matters, at the sub-micron particle sizes typically used, Van der Waals forces tend to lump the particles together creating segregation regions that are rich in either the powder or the sintering aid, thereby making an even distribution more difficult.

That, in the Sellers reference, the powder was mixed with the sintering aid in the traditional sense, but not uniformly on a microscopic scale;

That since the "uniform mixture," in the Sellers reference, is not completely homogeneous, this would create areas of differential densification that are not present in the herein claimed product;

That the starting powder is composed of particles which particles grow to form grains in the sintered product where the particles are no longer present;

That the explanation pertaining to disappearance of the powder particles is found on the first page of the color hand-out given the Examiner Xu at the interview on April 1, 2005;

That the comparison of the Sellers reference technology and the NRL technology, disclosed herein, is given on the second page of the hand-out where the product of the Sellers reference is shown as having poor localized transparency whereas the NRL product is

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shown as having good transparency throughout the entire sample;

That on the third page of the hand-out entitled "Trapped LiF due to Rapid Heating," it is noted that the Sellers reference wants to retain the sintering aid LiF at high temperatures of 1300-1600°C during the sintering/densification step, which is disclosed in col. 3, lines 22-43 of the Sellers reference;

That procedure disclosed in the Sellers reference concerning retention of the sintering aid, leads to trapped LiF sintering aid in closed pores, which LiF sintering aid cannot escape even at 1600°C;

That presence of LiF sintering aid in the product, disclosed by the Sellers reference, leads to areas of high optical scattering of light and reduced transparency, as shown by the two discs on the second page of the hand-out;

That page four of the hand-out is entitled "Exaggerated Grain Growth" wherein shown are two views of the product, the first made by the procedure disclosed by the Sellers reference and the second one made by the NRL procedure, i.e., the procedure herein;

That the first view on page four of the hand-out shows presence of exaggerated grain growth whereas the second view shows no exaggerated grain growth;

That, although optical transmission is not substantially negatively impacted by grain size, the exaggerated grain size will

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negatively impact mechanical properties;

That the last or fifth page of the hand-out is entitled "Transmission" and shows that light transmission through a sample will be negatively impacted by the reflections from the two end faces and the internal reflection;

That with theoretical total transmission of spinel being 87%, the spinel product made by the procedure disclosed by the Sellers reference had in-line transmission of 75% and total transmission of 65% whereas the spinel product, made by in the manner disclosed herein, had in-line transmission of 80% and total transmission of 70%.

The undersigned declarant declares further that all statements made herein are of his own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

4/20/05
Date

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